The foundation of our research focuses on the assessment and preservation of in-service structures, with a primary concentration in the domain of bridge engineering. This is an applied research area with emphasis on ensuring public safety. It relies heavily on experimental testing of structural components, in-service structures, and materials, with outcomes that feed directly to practice. The outcomes of my research have yielded advancements in the knowledgebase of the structural engineering community that are immediately beneficial to the Commonwealth of Virginia, but also to national interests related to an aging transportation infrastructure network. Our research approach often utilizes a combination of laboratory and field investigations and finite element modeling.
Bridge Engineering and Behavior
The deteriorating condition of the aging bridge superstructures across the nation challenges the reliability of transportation infrastructure network; whilst jeopardizing the economic health of the United States. Although the occurrence of sudden bridge failures due to unpredicted phenomena such as impact, flooding or other natural disasters is somewhat rare, the existence and propagation of any type of damage condition can significantly reduce the performance and serviceability of these superstructures. Our research is focused on creating a framework for integrating the most common damage mechanisms into a measure of system performance and correlate impacts of damage on system behavior and reserve capacity of routine highway bridges.

Structural Health Monitoring
We are exploring the use of vision-based sensing techniques for bridge condition assessment. For the typical bridge engineer, the concept of remote sensing can mean enhanced and safer inspection assessment without traffic disruption. Specifically, we are looking at the applicability of non-invasive sensing techniques as a means to assess and monitor bridge performance while providing state and local engineers with additional information in the form of a decision support system that can be used to prioritize critical maintenance and repair of the nation’s bridges.

Innovative Materials for Infrastructure
Concrete bridge decks represent a critical component of the nation’s bridge network; however, these components are deteriorating at a rapid rate. This deterioration can be attributed to a number of factors, but winter salt application, the diffusion of chlorides to the reinforcing steel, and the eventual corrosion is the primary culprit. Multiple protection solutions currently exist but each have shortcomings and do not completely address the problem. We are exploring the use of ultra-high performance concrete (UHPC), a relatively new material with exceptional strength and durability characteristics, as an alternate solution to traditional concrete bridge deck materials.

RECENT RESEARCH DEVELOPMENTS
- Established mobile laboratory for rapid evaluation of transportation infrastructure.
- Developing novel approaches for structural identification using digital image correlation (DIC).
- Formulating framework for crowd-sourced condition characterization of physical infrastructure – “citizen engineering”

RECENT GRANTS
- Mid-Atlantic Transportation Sustainability Center – University Transportation Center – Preserving Coastal Infrastructure through the Design and Implementation of Image-Based Structural Health Monitoring (iSHM)
- Virginia Transportation Research Council – Load Rating Strategies for Bridges with Missing or As-Built Information

SEAS Research Information
Pamela M. Norris,
Executive Associate Dean for Research
University of Virginia
Box 400242
Charlottesville, VA 22903
pamela@virginia.edu
434.243.7683